

Using trace element and halide isotopes to understand salinization mechanisms of groundwaters from an arid aquifer

KARINA MEREDITH^{1*}, SUZANNE HOLLINS¹,
PAUL TOMASCAK², TAKUYA MORIGUTI³, SHAUN FRAPE⁴
AND EIZO NAKAMURA²

¹ANSTO, Institute for Environmental Research, Locked Bag
2001 Kirrawee DC NSW 2232 Australia
karina.meredith@ansto.gov.au
sho@ansto.gov.au

²State University of New York at Oswego, Oswego NY 13126-
3599, USA. tomascak@oswego.edu

³University of Waterloo, Canada shaun@uwaterloo.ca

⁴PML, Geochemistry and Cosmochemistry, Institute for Study
of the Earth's Interior, Okayama University at Misasa,
Tottori, 682-01, Japan
moriguti@misasa.okayama-u.ac.jp
eizonak@misasa.okayama-u.ac.jp

Saline groundwaters are common to inland Australia, yet many aspects of their hydrochemical evolution remain uncertain. The saline groundwaters in the alluvial aquifers of the Darling River have previously been found to exhibit broad similarity in traditional hydrochemical and isotopic tracers. By contrast, trace element isotopes ($\delta^7\text{Li}$, $\delta^{11}\text{B}$ and $^{87}\text{Sr}/^{86}\text{Sr}$) and halide isotopes ($\delta^{37}\text{Cl}$ and $\delta^{81}\text{Br}$) provide evidence of more complex hydrogeochemical processes. Hydrochemical evolution was found to be dependent on proximity to the Darling River and depth even though all groundwaters from this aquifer were found to be saline. The differing signatures highlighted the discovery of a deeper palaeo-groundwater system containing heavier trace element and halide isotope values. The measurement of these isotopes has permitted delineation of groundwater end-members and salinization mechanisms that would have otherwise not been identified.